Abstract of the Disclosure

Apparatus and method for integrating rare-earth doped lasers and optics on glass substrates. An optical (e.g., laser) component formed from a glass substrate doped with a optically active lanthanides species with a plurality of waveguides defined by channels within the substrate. The laser component may constitute a monolithic array of individual waveguides in which the waveguides of the array form laser resonator cavities with differing resonance characteristics. The channels defining the waveguides are created by exposing a surface of the substrate to an ion-exchange solvent through a mask layer having a plurality of line apertures corresponding to the channels which are to be formed. Another aspect is directed toward pumping the laser. A laser component formed from a glass substrate doped with a laser species and having one or more substrate waveguides defined therein, and a superstrate waveguide cavity, or cladding, positioned adjacent the substrate waveguide for supplying the latter with pump light. Another aspect provides a closed crucible processing of optical waveguides on a glass substrate. Waveguides are created by exposing a surface of the substrate to an ion-exchange solvent (e.g., a molten potassium or sodium salt). A tightly sealed multi-part crucible made, for example, of aluminum, is sealed with a graphite gasket tightly clamped between flanges on opposing portions of the crucible, in order that gas does not leak in or out of the crucible during cooling or heating of the system. In one embodiment, a potassium-doped waveguide is buried by a thin sodium-doped layer.

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